Repco

GENUINE REPCO QUALITY

INVERTER MIG TIG MMA WELDER

140 Amp

Instruction Manual

RW1500MP

Congratulations on the purchase of your new Repco RW1500MP Multiprocess MIG/TIG/ARC Welder

Please ensure you have familiarised yourself with the instructional DVD and read the contents of this manual before using your machine.

Contents

Safety Information 4
Overview 11
Unpacking your Machine 11
Machine Specifications 12
Know your Welder 13
Machine Installation 15
MIG Welding Operation 16
    Fitting Wire Spool 16
    Gasless MIG Operation 16
    Gas Shielded MIG Operation 17
    Spool Gun Operation 17
ARC/ MMA Welding Operation 19
TIG Welding Operation 19
Control Settings Quick Reference Chart 20
Consumables & Accessories 21
Basic MIG Welder Guide 22
MIG Welding Troubleshooting 26
Basic MMA/ARC Welding Guide 29
MMA/ARC Troubleshooting 35
Basic TIG Welding Guide 36
TIG Welding Troubleshooting 39
Machine Care & Maintenance 40
Warranty 41

Safety Information

SAVE THIS MANUAL
Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

IMPORTANT SAFETY INFORMATION
In this manual, on the labelling, and all other information provided with this product:

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

General Power Tool Safety Warnings

WARNING Read all safety warnings and instructions.
Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury. Save all warnings and instructions for future reference. The term "power tool" in the warnings refers to your mains operated (corded) power tool.

1. Work area safety

a. **Keep work area clean and well lit.** *Cluttered or dark areas invite accidents.*
b. **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** *Power tools create sparks which may ignite the dust or fumes.*
c. **Keep children and bystanders away while operating a power tool.** *Distractions can cause you to lose control.*

2. Electrical safety

a. **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with grounded power tools.** *Unmodified plugs and matching outlets will reduce risk of electric shock.*
b. **Avoid body contact with grounded surfaces such as pipes, radiators, ranges and refrigerators.** *There is an increased risk of electric shock if your body is grounded.*
c. **Do not expose power tools to rain or wet conditions.** *Water entering a power tool will increase the risk of electric shock.*
d. **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** *Damaged or entangled cords increase the risk of electric shock.*
e. **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** *Use of a cord suitable for outdoor use reduces the risk of electric shock.*
f. **If operating a power tool in a damp location is unavoidable, use a Ground Fault Circuit Interrupter (GFCI) protected supply.** *Use of a GFCI reduces the risk of electric shock.*

3. Personal safety

a. **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.** *A moment of inattention while operating power tools may result in serious personal injury.*
b. **Use safety equipment.** *Always wear AS/NZS approved safety glasses and ARC shaded, resistant safety full face shield. Safety equipment such as NIOSH-approved respirator, heavy-duty work gloves, non-skid safety shoes, or hearing protection used for appropriate conditions will reduce personal injuries.*
c. **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source or moving the tool.** *Carrying power tools with your finger on the switch or energizing power tools that have the switch on invites accidents.*
d. **Remove any adjusting key or wrench before turning the power tool on.** *A wrench or a key left attached to a rotating part of the power tool may result in personal injury.*
e. **Do not overreach. Keep proper footing and balance at all times.** *This enables better control of the power tool in unexpected situations.*
f. **Dress properly. Do not wear loose clothing or jewellery. Keep your hair, clothing and gloves away from moving parts.** *Loose clothes, jewellery or long hair can be caught in moving parts.*
g. **If devices are provided for the connection of dust extraction and col- lection facilities, ensure these are connected and properly used.** *Use of these devices can reduce dust- related hazards.*

Only use safety equipment that has been approved by an appropriate standards agency. *Unapproved safety equipment may not provide adequate protection. Eye protection must be AS/NZS or ANSI-approved and breathing protection must be AS/NZS or ANSI-approved for the specific hazards in the work area.*

4. Power tool use and care

a. **Do not force the power tool. Use the correct power tool for your application.** *The correct power tool will do the job better and safer at the rate for which it was designed.*

b. **Do not use the power tool if the switch does not turn it on and off.** *Any power tool that cannot be controlled with the switch is dangerous and must be repaired.*

c. **Disconnect the plug from the power source from the power tool before making any adjustments, changing accessories, or storing power tools.** *Such preventive safety measures reduce the risk of starting the power tool accidentally.*

d. **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** *Power tools are dangerous in the hands of untrained users.*

e. **Maintain power tools. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If dam- aged, have the power tool repaired before use.** *Many accidents are caused by poorly maintained power tools.*

f. **Keep cutting tools sharp and clean.** *Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.*

g. **Use the power tool, accessories and tool bits etc. in accordance with these instructions, taking into account the working conditions and the work to be performed.** *Use of the power tool for operations different from those intended could result in a hazardous situation.*

5. Service

Have your power tool serviced by a qualified repair person using only identical replacement parts. *This will ensure that the safety of the power tool is maintained.*

MIG Welder Safety Warnings

1. **Maintain labels and nameplates on the Welder.** These carry important information. If unreadable or missing, contact your nearest Repco Branch for a replacement.
2. **Maintain a safe working environment.** Keep the work area well lit. Make sure there is adequate surrounding workspace. Always keep the work area free of obstructions, grease, oil, trash, and other debris. Do not use a power tool in areas near flammable chemicals, dusts, and vapours. Do not use this product in a damp or wet location.
3. **Avoid unintentional starting.**
   Make sure you are prepared to begin work before turning on the Welder.
4. **Unplug before performing maintenance.** Always unplug the Welder from its electrical outlet before performing any inspection, maintenance, or cleaning procedures.
5. **Never leave the Welder unattended while energized.** Turn power off if you have to leave the Welder.
6. **Maintain a safe working environment.** Keep the work area well lit. Make sure there is adequate surrounding workspace. Always keep the work area free of obstructions, grease, oil, trash, and other debris.
7. **Prevent eye injury and burns.** Wearing and using AS/NZS or ANSI-approved personal safety clothing and safety devices reduce the risk of injury.

- Wear AS/NZS or ANSI-approved safety impact eye goggles underneath welding eye protection featuring at least a number 10 shade lens rating, such as the one included.
- Leather leggings, fire resistant shoes or boots should be worn when using this product. Do not wear pants with cuffs, shirts with open pockets, or any clothing that can catch and hold molten metal or sparks.
- Keep clothing free of grease, oil, solvents, or any flammable substances. Wear dry, insulating gloves and protective clothing.
- Wear an approved head covering to protect the head and neck. Use aprons, cape, sleeves, shoulder covers, and bibs designed and approved for welding and cutting procedures.
- When welding/cutting overhead or in confined spaces, wear flame resistant ear plugs or ear muffs to keep sparks out of ears.

8. **Prevent accidental fires.** Remove any combustible material from the work area.

- When possible, move the work to a location well away from combustible materials. If relocation is not possible, protect the combustibles with a cover made of fire resistant material.
- Remove or make safe all combustible materials for a radius of 10 metres around the work area. Use a fire resistant material to cover or block all open door- ways, windows, cracks, and other openings.
- Enclose the work area with portable fire resistant screens. Protect combustible walls, ceilings, floors, etc., from sparks and heat with fire resistant covers.
- If working on a metal wall, ceiling, etc., prevent ignition of combustibles on the other side by moving the combustibles to a safe location. If relocation of combustibles is not possible, designate someone to serve as a fire watch, equipped with a fire extinguisher, during the cutting process and for at least one half hour after the cutting is completed.
- Do not weld or cut on materials having a combustible coating or combustible internal structure, as in walls or ceilings, without an approved method for eliminating the hazard.
- Do not dispose of hot slag in containers holding combustible materials. Keep a fire extinguisher nearby and

know how to use it.

- After spot welding, make a thorough examination for evidence of fire. Be aware that easily visible smoke or flame may not be present for some time after the fire has started. Do not weld or cut in atmospheres containing dangerously reactive or flammable gases, vapours, liquids, and dust. Provide adequate ventilation in work areas to prevent accumulation of flammable gases, vapours, and dust.
  Do not apply heat to a container that has held an unknown sub- stance or a combustible material whose contents, when heated, can produce flammable or explosive vapours. Clean and purge containers before applying heat. Vent closed containers, including castings, before preheating, welding, or cutting.

9. **Avoid overexposure to fumes and gases.** Always keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation or exhaust, or both, to keep fumes and gases from your breathing zone and general area.

- Where ventilation is questionable, have a qualified technician take an air sampling to determine the need for corrective measures. Use mechanical ventilation to improve air quality. If engineering controls are not feasible, use an approved respirator.
- Work in a confined area only if it is well-ventilated, or while wearing an air-supplied respirator. Follow OSHA guidelines for Permissible Exposure Limits (PEL's) for various fumes and gases.
- Follow the American Conference of Governmental Industrial Hygienists recommendations for Threshold Limit Values (TLV's) for fumes and gases.
- Have a recognized specialist in Industrial Hygiene or Environmental Services check the operation and air quality and make recommendations for the specific welding or cutting situation.

WARNING

INHALATION HAZARD:
Welding and Plasma Cutting Produce TOXIC FUMES.

Exposure to welding or cutting exhaust fumes can increase the risk of developing certain cancers, such as cancer of the larynx and lung cancer. Also, some diseases that may be linked to exposure to welding or plasma cutting exhaust fumes are:

• Early onset of Parkinson's Disease • Heart disease • Ulcers • Kidney damage • Damage to the reproductive organs • Respiratory diseases such as emphysema, bronchitis, or pneumonia • Inflammation of the small intestine or stomach

Use natural or forced air ventilation and wear an AS/NZS or ANSI approved respirator to protect against the fumes produced to reduce the risk of developing the above illnesses.

10. **Avoid overexposure to fumes and gases.** Always keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation or exhaust, or both, to keep fumes and gases from your breathing zone and general area.
11. **Do not touch live electrical parts.** Wear dry, insulating gloves. Do not touch electrode or conductor tong with bare hand. Do not wear wet or damaged gloves.
12. **Protect yourself from electric shock.** Do not use outdoors. Insulate yourself from the workpiece and ground. Use non-flammable, dry insulating material if possible, or use dry rubber mats, dry wood or plywood, or other dry insulating material big enough to cover your full area of contact with the work or ground.
13. **WARNING!** This product, when used for welding and similar applications, contains or produces a chemical known cause cancer and birth defects (or other reproductive harm). Handling the wire on this product will expose you to lead, a chemical known to cause cancer, and birth defects or other reproductive harm. Wash hands after handling. To reduce your exposure to these chemicals work in a well-ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles. Your risk from these exposures varies, depending on how often you do this type of work.
14. **WARNING! People with pacemakers should consult their physician(s) before using this product.** Electromagnetic fields in close proximity to a heart pacemaker could cause interference to, or failure of the pacemaker
15. **Ensure that the unit is placed on a stable location before use.** If this unit falls while plugged in, severe injury, electric shock, or fire may result.
16. The warnings, precautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

SAVE THESE INSTRUCTIONS.

ARC WELDING SAFETY INSTRUCTIONS AND WARNINGS

WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.
Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.
Safe practices are outlined in the European Standard EN60974-1 entitled: Safety in welding and allied processes Part 2: Electrical. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

Arc Welding Hazards

WARNING ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on.
The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.

WARNING ARC RAYS can burn eyes and skin; NOISE can damage hearing.
Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Use a Welding Helmet or Welding Faceshield fitted with a proper shade of filter (see AS/NZS 1338.1, ANSI Z49.1 and EN 60974-1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.
6. Never wear contact lenses while welding.

Recommended Protective Filters for Electric Welding		
Description of Process	**Approximate Range of Welding Current in Amps**	**Minimum Shade Number of Filter(s)**
Manual Metal Arc Welding - covered electrodes (MMA)	Less than or equal to 100	8
	100 to 200	10
	200 to 300	11
	300 to 400	12
	Greater than 400	13
Gas Metal Arc Welding (GWAW) (MIG) other than Aluminium and Stainless Steel	Less than or equal to 150	10
	150 to 250	11
	250 to 300	12
	300 to 400	13
	Greater than 400	14
Gas Metal Arc Welding (GMAW) (MIG) Aluminium and Stainless Steel	Less than or equal to 250	12
	250 to 350	13
Gas Tungsten Arc Welding (GTAW) (TIG)	Less than or equal to 100	10
	100 to 200	11
	200 to 250	12
	250 to 350	13
	Greater than 350	14
Flux-cored Arc Welding (FCAW) -with or without shielding gas.	Less than or equal to 300	11
	300 to 400	12
	400 to 500	13
	Greater than 500	14
Air - Arc Gouging	Less than or equal to 400	12
Plasma - Arc Cutting	50 to 100	10
	100 to 400	12
	400 to 800	14
Plasma - Arc Spraying	—	15
Plasma - Arc Welding	Less than or equal to 20	8
	20 to 100	10
	100 to 400	12
	400 to 800	14
Submerged - Arc Welding	—	2(5)
Resistance Welding	—	Safety Spectacles or eye shield

Refer to standard AS/NZS 1338.1:1992 for comprehensive information regarding the above table.

WARNING
FUMES AND GASES can be hazardous to your health.

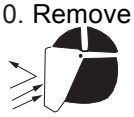
Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapours to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air- supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WARNING

WELDING can cause fire or explosion. Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 11m of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be aware that welding sparks and hot materials from welding can easily go through small cracks and openings into adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from travelling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.



WARNING

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

WARNING

CYLINDERS can explode if damaged. Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

NOTE Considerations about Welding and the Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields and interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding power source and cables as far away from body as practical.

ABOUT PACEMAKERS:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

How to Use This Manual

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings. Throughout this manual, the word WARNING, CAUTION and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING Gives information regarding possible personal injury.

CAUTION Refers to possible equipment damage.

NOTE Offers helpful information concerning certain operating procedures.

Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the machine. Record these numbers for future reference.

Receipt of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors. Include all equipment identification numbers as described above along with a full description of the parts in error.

Transportation Methods

Disconnect input power conductors from de-energized supply line before moving the welding power source.

Lift unit with handle on top of case. Use handcart or similar device of adequate capacity. If using a fork lift vehicle, secure the unit on a proper skid before transporting.

Overview

The Repco RW1500MP Multiprocess Inverter Welder is an extremely versatile welding machine, designed for light industrial, automotive, maintenance and serious DIY applications. The latest in electronic inverter technology enables the RW1500MP to produce professional welding results across a wide range of metals, including aluminium alloys, stainless steels and mild steel. The simple, intuitive controls and easy change over between the MIG, TIG and ARC processes, make the RW1500MP the welding machine of choice for anyone serious about multi-functional capability. The inverter technology utilised also makes the machine very compact and portable. The RW1500MP comes complete with a comprehensive range of welding accessories to utilise all welding processes offered.

Unpacking Your Machine

When unpacking your machines, please inspect the machine and accessories carefully to ensure all components have been received, as per the packing list below.

Included items:

Description	Qty
RW1500MP Welding Power Source	1
Instruction Manual	1
Instructional DVD	1
Wire Brush/ Chipping Hammer	1
MB15 3m MIG Torch	1
WP17 4m TIG Torch	1
2.5M Spool Gun	1
3m Earth Lead & Clamp	1
3m ARC Lead & Electrode Holder	1
2m x 8mm Gas Hose w/ clamps	1
Hand Held Face Shield	1

If you have any questions, please contact your nearest local Repco branch

Machine Specifications

Model		RW1500MP
Rated Input Voltage		230V AC Single Phase
Input Frequency		50/60 Hz
No Load Power Loss		50W
Efficiency		0.80
Power Factor		0.73
No Load Output Voltage		56V
MIG	**Rated Input Current**	21A
	Output Voltage Range	14V-22.5V
	Output Current Range	30-150A
	Load Duty Cycle	60%@100A/19V
TIG	**Rated Input Current**	15.6A
	Output Voltage Range	10.8V-15.9V
	Output Current Range	21-150A
	Load Duty Cycle	60%@127A/15V
	Arc Ignition System	High Frequency (HF)
MMA	**Rated Input Current**	24.5A
	Output Voltage Range	20.7V-25.4V
	Output Current Range	17-140A
	Load Duty Cycle	60%@82A/23.2V
Protection Class		IP21
Cooling Method		Fan Cooled
Standard		AS/NZS 60974.1-2006
Size		435mm x 285mm x 500mm
Weight		19.5 Kg

DUTY CYCLE

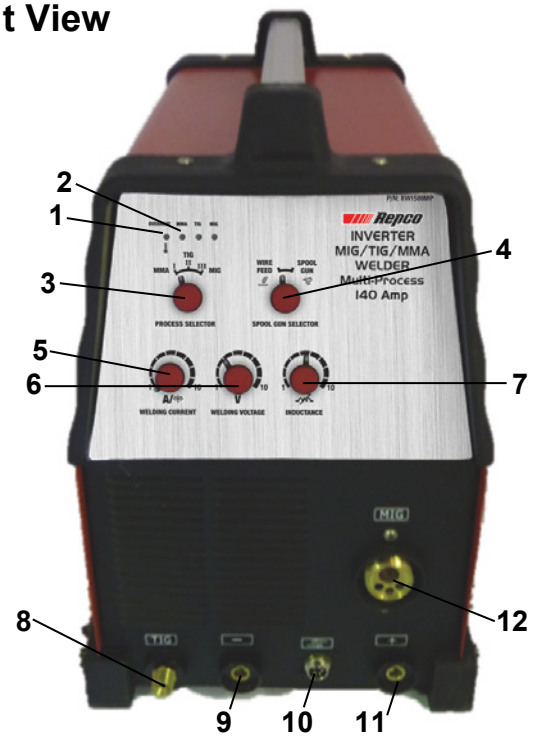
*** Note: The welding duty cycle is the percentage of actual continuous welding time that can occur in a ten minute cycle. E.g. 60% at 100 amps - this means the welder can weld continuously at 100 amps for 6 minutes and then the unit will need to be rested for 4 minutes.**

The duty cycle can be affected by the environment in which the welder is used. In areas with temperatures exceeding 40°C, the duty cycle will be less than stated. In areas less than 40°C higher duty cycles have been obtained.

All tests on duty cycles have been carried out at 40°C with a 50% humidity. So in practical working conditions the duty cycles will be much greater than those stated above.

Know Your Welder

Front View

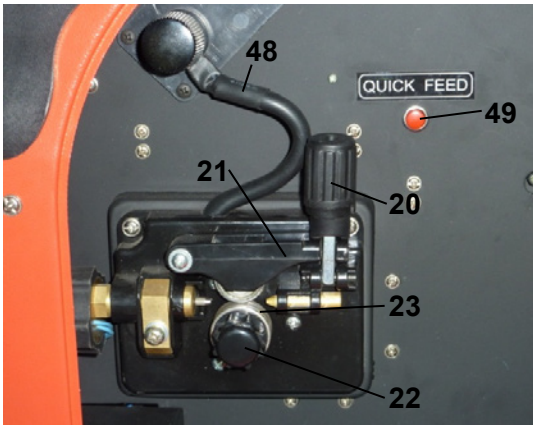


1. Thermal Overload Protection Indicator - Light indicates when machine has exceeded duty cycle and machine is in thermal overload mode.
2. Welding Mode Indicator Lights - Shows which welding mode is currently selected.
3. Welding mode selection knob
4. Machine wirefeed/ spool gun selector knob - Selects between the internal wire feeder and the spool gun wire feed.
5. Welding Current/ wire feed speed adjustment knob - In MMA and TIG mode, adjusts welding current. Adjusts wire feed speed in MIG mode.
6. Welding voltage adjustment knob - Adjusts welding voltage in MIG mode
7. Arc Inductance adjustment knob*
8. TIG torch connection fitting
9. Negative (-) welding power connection socket
10. Remote plug connection socket.
11. Positive (+) welding power connection socket
12. MIG Torch 'Euro' Connection Socket

Rear View

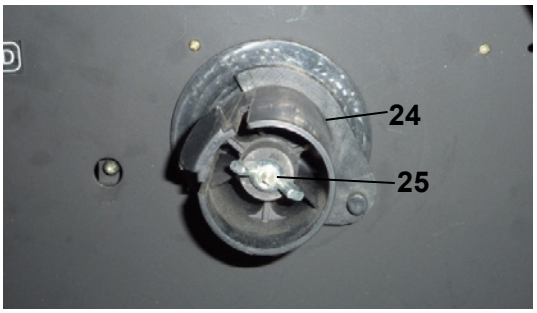
13. Specification Plate
14. Mains Power Switch
15. Mains Power Input Cable
16. TIG Gas Inlet
17. MIG Gas Inlet
18. Cooling Fan Grille
19. 36V AC Power Socket - Used for accessories requiring 36V power supply, such as heated CO2 regulator

* Inductance adjustment gives the effect of fine tuning the intensity of the welding arc. Lower inductance makes the arc 'softer' with less weld spatter. Higher inductance gives a stronger, driving arc which can increase penetration and weld speeds. Optimum inductances setting is affected by many welding variables; such as material type, shielding gas type, joint type, welding amperage, wire size. Some basic inductance adjustment figures are given in the settings quick reference guide (Page 20). Because of this, it is recommended that unless the operator is an experienced welder, the inductance adjustment left within these given settings.

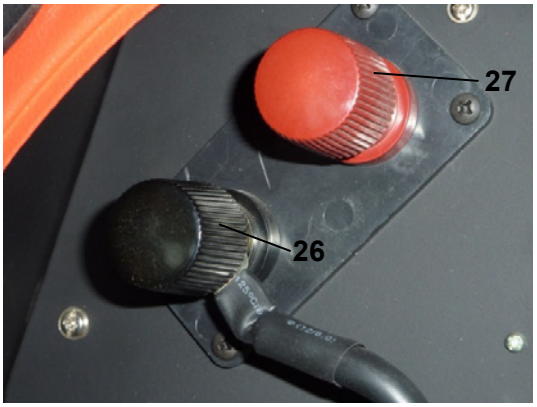


Inside Wire Feed Cover

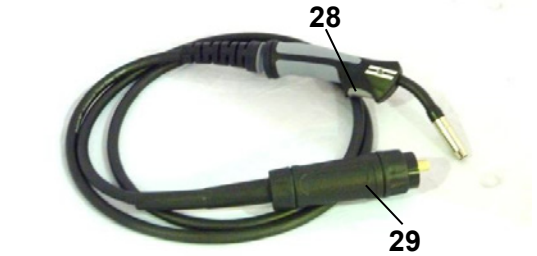
20. Wire feed tension adjustment lever
21. Wirefeed tension arm
22. Wirefeed roller retainer
23. Wire drive roller
48. MIG Power Connection Lead
49. Wire feed/ inching button



24. Wire Spool Holder
25. Wire Spool Holder Brake Adjustment

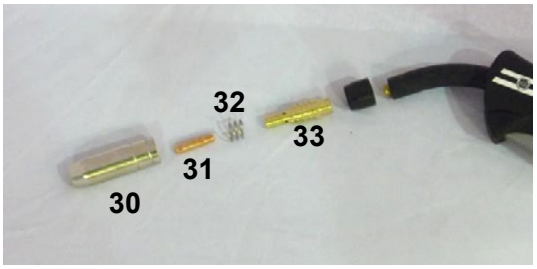


26. Negative Connection Terminal (Black)
27. Positive Connection Terminal (Red)



MIG Torch

28. Torch Trigger Switch
29. MIG Torch Euro Connector



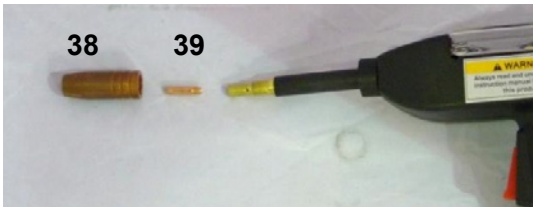
MIG Torch Consumables

30. Conical Nozzle/Shroud
31. MIG Welding Tip
32. MIG Shroud Spring
33. Tip Adaptor

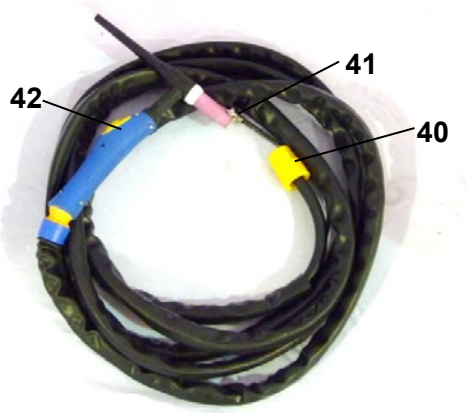
MMA/ARC Welding Lead Set

34. Earth Lead with Clamp
35. ARC lead with Electrode Holder

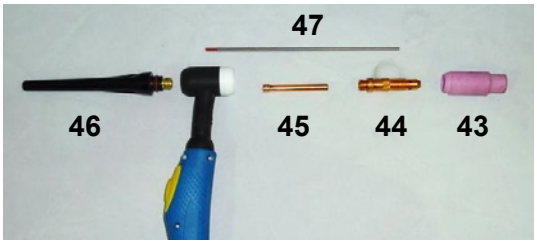
Spool Gun
36. Spool Gun Euro Connector
37. Spool Gun Remote Plug



Spool Gun Consumables
38. Spool Gun Conical Nozzle
39. MIG Welding Tip



TIG Welding Torch
40. TIG Torch Connection Nut
41. TIG Torch Remote Plug
42. Torch Trigger



TIG Torch Consumables
43. TIG Ceramic Nozzle
44. Collet Body
45. Collet
46. Torch Back Cap
47. Tungsten

Machine Installation

Electrical Connection
The RW1500MP is designed to run on a standard 10A 230-240V AC power supply. If an extension cord must be used, it should be no longer than 10m and be a heavy duty industrial version with a minimum cable core of 2.5mm^2.

Operating Environment
Adequate ventilation is required to provide a proper cooling for the RW1500MP. Ensure that the machine is placed on a stable level surface where clean cool air can easily flow through the unit. The RW1500MP has electrical components and control circuit boards which will be damaged by excessive dust and dirt, so a clean operating environment is essential.

MIG Welding Operation

1. Fitting Wire Spool

1.1 Open the cover door for the wire feed compartment. Push the D200 wire spool onto the spool holder (24) until past the locking tab, ensuring the end of the wire exists towards the wire feeder from the bottom of the spool.

1.2 Set the spool brake tension by rotating the adjustment wing nut (25). Clockwise to increase brake tension, anti-clockwise to decrease brake tension. The spool brake tension should be set so that the spool can rotate freely, but does not continue to rotate once the wire feed stops. This may need to be adjusted as the wire is used up and the spool weight decreases.

1.3 Release the wire feed tension arm (21) by pulling the wire feed tension adjustment lever (20) towards you.

1.4 Check the wire drive roller (23) groove matches the selected MIG wire type and size. The drive roller will have two different sized grooves; the size of the groove in use is stamped on the side of the drive roller facing out. For flux cored 'soft' wire, such as that used in gasless MIG welding, the drive roller groove has a serrated profile. For solid 'hard' MIG wire, the roller groove has a 'v' shaped profile.

1.5 The drive roller is removed by threading the drive roller retainer (22) off in the anti-clockwise direction. Once the correct drive roller profile is selected, re-fit the drive roller.

1.6 Hand thread the MIG wire from the spool through the input tube, through the drive roll groove and into the outlet tube.

1.7 Replace the wire feed tension arm (21) and the tension adjustment lever (20). Double check the wire has located correctly in the drive roller groove.

Adjusting wire feed tension. This is accomplished by winding the knob on the tension adjustment lever (20). Clockwise will increase tension, anti-clockwise will decrease drive tension. Ideal tension is as little as possible, while maintaining a consistent wire feed with no drive roller slippage. Check all other causes of excess wire feeding friction causing slippage first, such as; incorrect/ worn drive roller, worn/ damaged torch consumables, blocked/ damaged torch wire guide liner, before increasing wire feed tension.

Warning! - Before changing the feed roller or wire spool, ensure that the mains power is switched off.

Warning! - The use of excessive feed tension will cause rapid and premature wear of the drive roller, the support bearing and the drive motor/ gearbox.

2 Gasless MIG Welding Operation

2.1 Connect the MIG Torch Euro Connector (29) to the MIG torch connection socket (12) on the front of the machine. Secure by firmly hand tightening the threaded collar on the MIG Torch connector clockwise.

2.2 Check that the correct flux cored, self-shielding MIG wire, matching drive roller (23) and welding tip (31) are fitted.

2.3 Inside the wire feed compartment, connect the MIG power connection lead (48) to the negative connection terminal (black, 26).

2.4 Connect the earth lead (34) to the positive (+) output power socket on the front of the machine (11). Your connections should look like below.

MIG Torch

Earth Lead

2.5 Connect the earth clamp to the work piece. Contact with the workpiece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.

2.6 Remove the MIG torch conical nozzle (30) and the welding tip (31) from the torch.

2.7 Switch the welding machine on using the mains power switch (14).

2.8 Select MIG welding mode with the mode selection knob (3) and select 'wire feed' with the wire feed selection knob (4)

2.9 Now briefly pull the trigger on the MIG torch to ensure the wire is feeding smoothly through the wire feeder. Once this is checked the wire can be fed through the torch by pressing and holding the wire feeding button (49) inside the wire compartment. While feeding the wire through the torch, keep the torch lad and hand piece as straight and well aligned as possible, to minimise the feeding tension.

2.10 Once the wire is through the MIG torch neck, replace the welding tip and conical nozzle and trim off any excess wire.
2.11 Set the wire speed knob (5), voltage knob (6) and inductance knob (7) according to the welding parameter and the reference guide on page 20.

3 Gas Shielded MIG Welding Operation

Note - Gas shielded MIG welding requires a shielding gas supply, gas regulator and gas shielded MIG wire. These accessories are not supplied standard with the RW1500MP. Please contact your local Repco branch for details.

3.1 Connect the MIG Torch Euro Connector (29) to the MIG torch connection socket (12) on the front of the machine. Secure by firmly hand tightening the threaded collar on the MIG Torch connector clockwise.
3.2 Check that the correct gas shielded MIG wire, matching drive roller (23) and welding tip (31) are fitted.
3.3 Inside the wire feed compartment, connect the MIG power connection lead (48) to the positive (+) connection terminal (red, 27).
3.4 Connect the earth lead (34) to the negative output power socket on the front of the machine (9). Your connections should look like below.

MIG Torch

Earth Lead

3.5 Connect the earth clamp to the work piece. Contact with the workpiece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
3.6 Remove the MIG torch conical nozzle (30) and the welding tip (31) from the torch.
3.7 Switch the welding machine on using the mains power switch (14).
3.8 Select MIG welding mode with the mode selection knob (3) and select ‘wire feed’ with the wire feed selection knob (4)
3.9 Now briefly pull the trigger on the MIG torch to ensure the wire is feeding smoothly through the wire feeder. Once this is checked the wire can be fed through the torch by pressing and holding the wire feeding button (49) inside the wire compartment. While feeding the wire through the torch, keep the torch lead and hand piece as straight and well aligned as possible, to minimise the feeding tension.
3.10 Once the wire is through the MIG torch neck, replace the welding tip and conical nozzle and trim off any excess wire.
3.11 Connect the gas regulator and gas line to the MIG welding gas inlet on the rear panel (17). If the regulator is equipped with a flow gauge, the flow should be set between 8-15L/minute depending on welding parameters. If gas regulator is not equipped with a flow gauge, adjust pressure so that gas can be just heard flowing from the torch conical nozzle.
3.12 Set the wire speed knob (5), voltage knob (6) and inductance knob (7) according to the welding parameter and the reference guide on page 20.

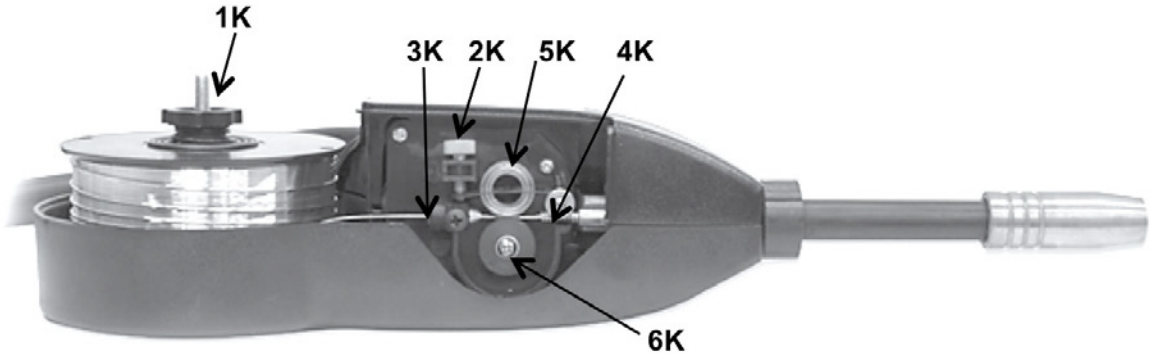
You are now ready to weld!

Spool Gun MIG Welding Operation

Note - Gas shielded MIG welding requires a shielding gas supply, gas regulator and gas shielded MIG wire. These accessories are not supplied standard with the RW1500MP. Please contact your local Repco branch for details.

Spool Gun Overview. The spool gun is a very useful addition to a MIG welder. It can be used for all types of MIG welding, but it has two primary advantages over a conventional ‘push’ wire feeder. The main advantage is that distance that the wire has to travel from the spool to the welding tip is very short, compared with a conventional torch. This greatly reduces the wire feeding friction and improves the wire feed speed smoothness and consistency, thus the welding quality is greatly improved. This is especially so with ‘soft’ wires such as Aluminium. It is very difficult to get Aluminium to feed smoothly in smaller welding machines, even with special torch liners and short torch lengths.
The second advantage is that the gun can allow the use of the small D100 wire spools at a distance from the power source (This distance is only limited by the length of the spool gun lead). This is advantageous for high cost wire, that is not used commonly such as Stainless Steel or MIG brazing wire. It saves the outlay cost for a much more expensive, larger D200 spool.

4 Installing Wire in Spool Gun



4.01 Unthread the outer cover retainer and remove the clear spool cover. Remove the spool retaining nut and the brake spring (1K)
4.02 Fit the D100 MIG wire spool onto the shaft. Replace the brake spring and spool retaining nut and tighten accordingly.
4.03 Feed the wire from the spool through the inlet guide (3K), in between the drive roller (6K) and the support roller (5K) and into the spool gun neck liner (4K). To assist with putting the wire through between the drive roller and support roller, loosen the brass spool tensioner thumb screw (2K).
4.04 Once wire fed through into neck liner (4K), re-tighten tensioner thumb screw until the support roller applies light pressure on the welding wire. Excess pressure will deform soft wire and cause feeding issues.
4.05 Replace the clear spool cover and fasten the outer cover retainer.

4.1 Connect the Spool Gun Euro Connector (36) to the MIG torch connection socket (12) on the front of the machine. Secure by firmly hand tightening the threaded collar on the MIG Torch connector clockwise.
4.2 Connect the spool gun remote plug (37) to the remote plug connection socket on the front of the machine (10).
4.3 Inside the wire feed compartment, connect the MIG power connection lead (48) to the positive connection terminal (red, 27).
4.4 Connect the earth lead (34) to the negative output power socket on the front of the machine (9). Your connections should look like below.

MIG Torch

Earth Lead

4.5 Connect the earth clamp to the work piece. Contact with the work piece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
4.6 Remove the spool gun conical nozzle (38) and the welding tip (39) from the torch.
4.7 Switch the welding machine on using the mains power switch (14).
4.8 Select MIG welding mode with the mode selection knob (3) and select ‘spool gun’ with the wire feed selection knob (4)
4.9 Now pull the trigger on the spool gun torch to ensure the wire is feeding smoothly through the neck. Use the wire speed adjustment knob (5) to increase the feeding speed if necessary.
4.10 Once the wire is through the spool gun neck, replace the welding tip and conical nozzle and trim off any excess wire.
4.11 Connect the gas regulator and gas line to the MIG welding gas inlet on the rear panel (17). If the regulator is equipped with a flow gauge, the flow should be set between 8-15L/minute depending on welding parameters. If gas regulator is not equipped with a flow gauge, adjust pressure so that gas can be just heard flowing from the torch conical nozzle.
4.12 Set the wire speed knob (5), voltage knob (6) and inductance knob (7) according to the welding parameter and the reference guide on page 20.

You are now ready to weld!

ARC/ MMA Welding Operation

Note - MMA Welding requires flux covered welding electrodes. These accessories are not supplied standard with the RW1500MP. Please contact your local Repco branch for details.

4.1 Connect the earth clamp and lead (34) to the negative (-) power connection socket (9)
4.2 Connect the earth clamp to the work piece. Contact with the work piece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
4.3 Connect the electrode holder and work lead (35) to the positive (+) power connection socket (11).

Note - This polarity connection configuration is valid for most GP (General Purpose) MMA electrodes. There are variances to this. If in doubt, check the electrode specifications or consult the electrode manufacturer.

4.4 Switch the welding machine on using the mains power switch (14).
4.5 Select MMA welding mode with the mode selection knob (3).
4.6 Adjust the welding current knob (5) to suit the welding application and the electrode diameter.
You are ready to weld!

TIG Welding Operation

Note - TIG Welding requires an Argon gas supply, gas regulator and possibly TIG filler wire rods. These accessories are not supplied standard with the RW1500MP. Please contact your local Repco branch for details.
5.1 Connect the TIG torch connection nut (40) to the machine TIG torch connection fitting and thread hand tight. Connect the TIG torch remote plug (41) to the machine remote plug socket (10).
5.2 Connect the earth lead (34) to the positive (+) output power socket on the front of the machine (11). Your connections should look like below.

TIG Torch

Earth Lead

5.3 Connect the earth clamp to the work piece. Contact with the work piece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
5.4 Ensure all TIG torch consumables are in place as illustrated in “Know your Welder” section, page X.
5.5 Switch the welding machine on using the mains power switch (14).
5.6 Select TIG welding mode with the mode selection knob (3).
5.7 Connect the gas regulator and gas line to the TIG welding gas inlet on the rear panel (16). If the regulator is equipped with a flow gauge, the flow should be set between 5-10L/minute depending on welding parameters. If gas regulator is not equipped with a flow gauge, adjust pressure so that gas can be just heard flowing from the torch ceramic nozzle.
5.8 Adjust the welding current knob (5) to suit the welding application and the tungsten diameter, further guidelines in the ‘TIG welding basics’ section.
You are ready to weld!

Some notes regarding TIG welding with your RW1500MP:
The RW1500MP is a DC (Direct Current) output welder only – this means that it is unable to TIG weld reactive metals such as Aluminium alloys and Brass (which require AC output). DC TIG output is suitable for steel, stainless steel and copper.
The RW1500MP utilises a HF arc ignition system for TIG welding. This means that when starting the arc, it is not required to touch the tungsten to the work piece. Simply position the tungsten approximately 5mm from the work piece and press the torch trigger. The HF will ‘jump’ across the gap and initiate the main welding arc. The shielding gas will continue to flow on after the trigger has been released for approximately 10 seconds. This is called ‘post flow’ period. This is to protect the tungsten from atmospheric contamination while it is still cooling down. For the same reason, the post gas flow should also be directed over the weld area until it has cooled down sufficiently.

Control Settings Quick Reference Chart

RPW1500MP Welding Settings Quick Reference Chart											
MIG Welding Parameter					Material Thickness (mm)						
Welding Material	**Wire Type**	**Polarity**	**Wire Size**	**Shielding Gas**	**1**	**2**	**3**	**4**	**5**	**6**
					Settings Key: Voltage/ Wirespeed/ Inductance					
Mild Steel	Self-Shielded Flux Core	Torch Negative (-)	0.8mm	N/A	-	2/2.5/5	5/5/5	7/6/5	8/7/5	-
Mild Steel	Solid Wire ER70S-6	Torch Positive (+)	0.6mm	75% Argon + 25% CO2	2/3/0	4/5/0	7/9/0	-	-	-
Mild Steel	Solid Wire ER70S-6	Torch Positive (+)	0.8mm	75% Argon + 25% CO2	0.5/1.5/3	2.5/2.5/3	5/4.5/3	6/5.5/3	7/7/3	9/9/3
Mild Steel	Solid Wire ER70S-6	Torch Positive (+)	0.6mm	100% CO2	3/4.5/0	5/5/0	8/8/0	-	-	-
Mild Steel	Solid Wire ER70S-6	Torch Positive (+)	0.8mm	100% CO2	2.5/2/0	3/3/0	5/3.5/0	6/5.5/0	8.5/7/0	8/7/0
Aluminium for use with Spool Gun										
Aluminium	Aluminium 5356 Alloy	Torch Positive (+)	0.8mm	100% Argon	1/2.5/0	2/4.5/0	3.5/5/0	4.5/5.5/0	5.5/6.5/0	8/7/0
Use chart as guide only, as optimal settings will vary with joint type and operator technique. Cells left blank not recommended configuration										

TIG Welding Parameter				Material Thickness (mm)					
Welding Material	**Polarity**	**Tungsten**	**Shielding Gas**	**1**	**2**	**3**	**4**	**5**	**6**
		Diameter		Settings Key: Current					
Mild/ Stainless Steel	Earth Positive (+)	1.6mm	100% Argon	2	3	5	-	-	-
Mild/ Stainless Steel	Earth Positive (+)	2.4mm	100% Argon	-	-	-	6	7	9
Use this chart as a guide only, as optimal settings will vary with joint type and operator technique. Cells left blank are not a recommended configuration.									

Consumables & Accessories

It is very important to recognise that welding torch consumables wear as part of normal operation and should be replaced in a timely manner. Operating a torch with warn consumables will cause poor welding results and possible damage to the torch and machine itself.

MB15 MIG torch consumables

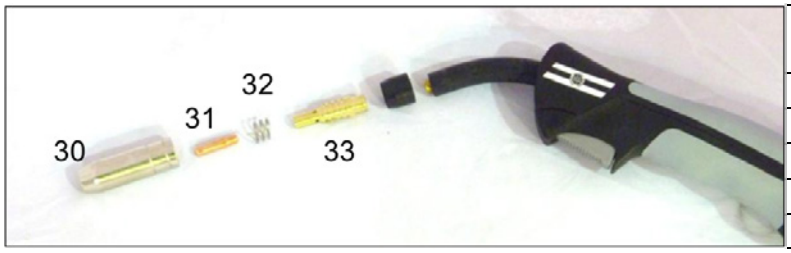


Image Number	Description	Replacement Part Number
30	Conical Nozzle	RWNC-2
31	Welding Tip 0.6mm	RWT06
31	Welding Tip 0.8mm	RWT08
32	Shroud Spring	RWSS1557
33	Tip Adaptor	RWTA1507

Caution! The tip adaptor (33) threads onto the torch neck with a LH thread.

Spool Gun Wearing Consumables

Image Number	Description	Replacement Part Number
38	Spool Gun Conical Nozzle	RWNCS
39	Welding Tip 0.8mm	RWT08
39	Welding Tip 0.8mm Aluminium Wire	MMT1510

WP17 TIG Torch Consumables

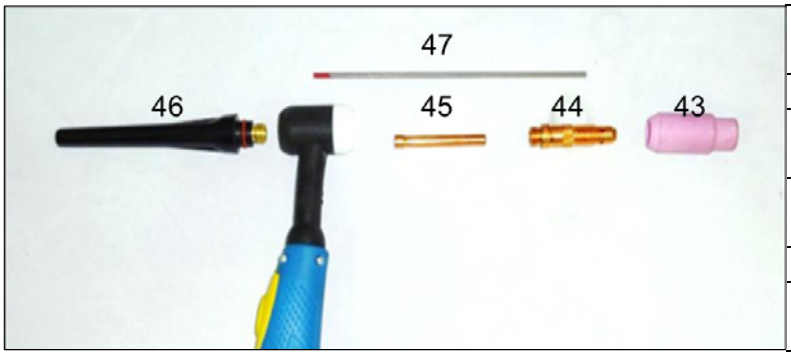


Image Number	Description	Replacement Part Number
43	TIG Ceramic Cup	RWTCC8
44	TIG Collet Body 1.6mm	RWTCB16
45	TIG Torch Collet 1.6mm	RWTC16
46	TIG Torch Back Cap	RWTBC
47	Thoriated Tungsten 1.6mm	RWTTT16

These wearing torch consumables and the list of accessories below are all available from your nearest Repco store.

Accessories Available

Part Number	Description
RW3000	Professional Welding Helmet - Red
RWGP	Professional Welding Gloves
RWM5	Welding Magnet - 5"
RWFC0850	MIG Wire 0.8mm Flux Cored, 5kg
RWMS0850	MIG Wire 0.8mm Mild Steel, 5kg
RWAL0805	MIG Wire 0.8mm Aluminium, 0.45kg
RWSS0805	MIG Wire 0.8mm Stainless Steel, 0.45kg
RWE2450	Electrodes 2.4mm General Purpose, 5kg
RWE3250	Electrodes 3.2mm General Purpose, 5kg

Part Number	Description
RWSS1605	TIG Rod 1.6mm Stainless Steel, 0.5kg
RWMS1610	TIG Rod 1.6mm Mild Steel, 1kg
RWGRP	Argon Regulator with CO2 Adapter
RWELH400	400amp Electrode Holder
MPDG	MIG Welding Tip Dip Gel 120g
MPAS4	MIG Welding Antispatter 400g
RWT10	MIG Tip 1.0mm 5pk
RW3000CL	Clear Lens for RPW3000

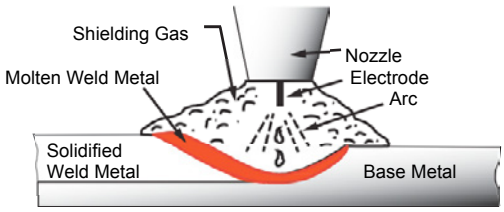
For all other spare parts and accessories, please contact your local Repco store.

Basic MIG Welding Guide

MIG (GMAW/FCAW) Basic Welding Technique

Two different welding processes are covered in this section (GMAW and FCAW), with the intention of providing the very basic concepts in using the MIG mode of welding, where a welding gun is hand held, and the electrode (welding wire) is fed into a weld puddle, and the arc is shielded by an inert welding grade shielding gas or inert welding grade shielding gas mixture.

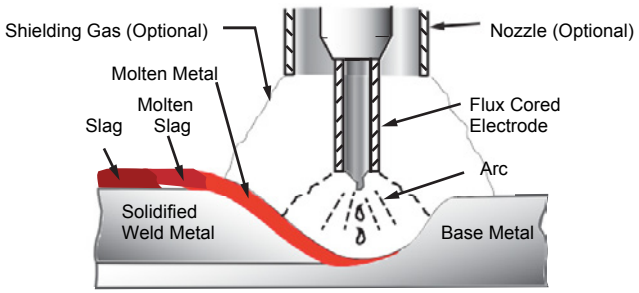
GAS METAL ARC WELDING (GMAW): This process, also known as MIG welding, CO_2 welding, Micro Wire Welding, short arc welding, dip transfer welding, wire welding etc., is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a solid continuous, consumable electrode and the work. Shielding is obtained from an externally supplied welding grade shielding gas or welding grade shielding gas mixture. The process is normally applied semi automatically; however the process may be operated automatically and can be machine operated. The process can be used to weld thin and fairly thick steels, and some non-ferrous metals in all positions.



GMAW Process

Figure 1-1

FLUX CORED ARC WELDING (FCAW): This is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a continuous flux filled electrode wire and the work. Shielding is obtained through decomposition of the flux within the tubular wire. Additional shielding may or may not be obtained from an externally supplied gas or gas mixture. The process is normally applied semi automatically; however the process may be applied automatically or by machine. It is commonly used to weld large diameter electrodes in the flat and horizontal position and small electrode diameters in all positions. The process is used to a lesser degree for welding stainless steel and for overlay work.



FCAW Process

Figure 1-2

Position of MIG Torch
The angle of MIG torch to the weld has an effect on the width of the weld.

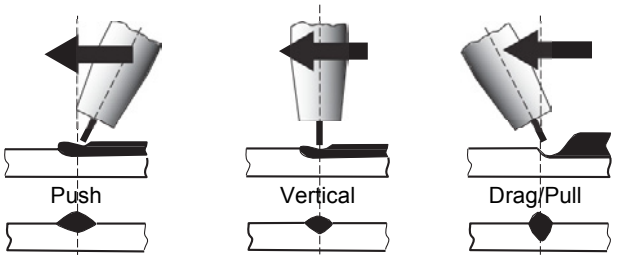


Figure 1-3

The welding gun should be held at an angle to the weld joint. (See Secondary Adjustment Variables below)

Hold the gun so that the welding seam is viewed at all times. Always wear the welding helmet with proper filter lenses and use the proper safety equipment.

Caution!
Do not pull the welding gun back when the arc is established. This will create excessive wire extension (stick-out) and make a very poor weld.

The electrode wire is not energized until the gun trigger switch is depressed. The wire may therefore be placed on the seam or joint prior to lowering the helmet.

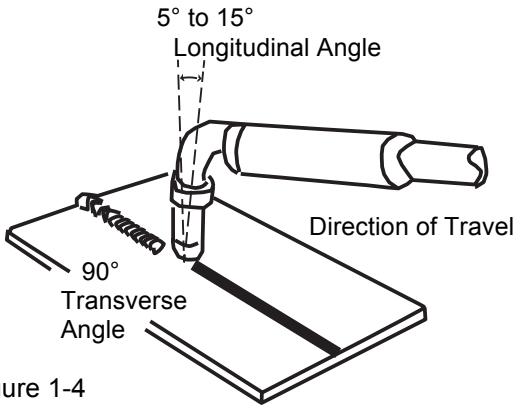


Figure 1-4

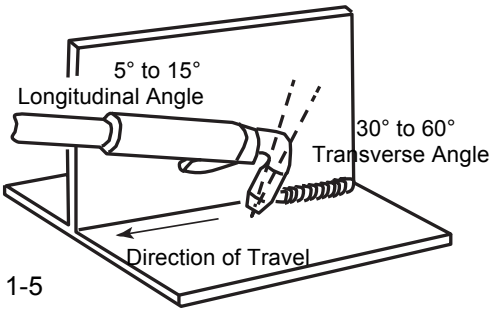
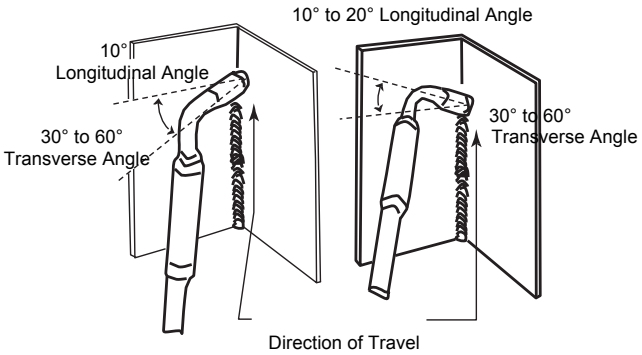


Figure 1-5



Vertical Fillet Welds
Figure 1-6

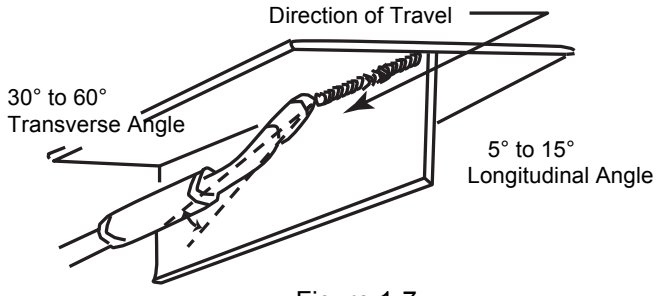


Figure 1-7

Distance from the MIG Torch Nozzle to the Work Piece
The electrode wire stick out from the MIG Torch nozzle should be between 10mm to 20.0mm. This distance may vary depending on the type of joint that is being welded.

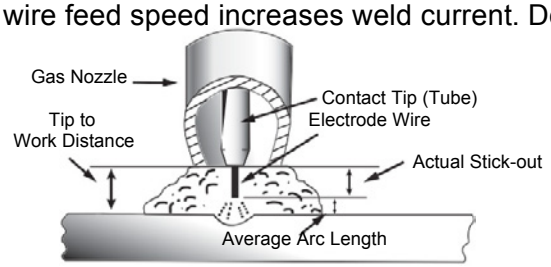
Travel Speed
The speed at which the molten pool travels influences the width of the weld and penetration of the welding run.

MIG Welding (GMAW) Variables
Most of the welding done by all processes is on carbon steel. The items below describe the welding variables in short-arc welding of 24gauge (0.024", 0.6mm) to ¼" (6.4mm) mild sheet or plate. The applied techniques and end results in the GMAW process are controlled by these variables.

Preselected Variables
Preselected variables depend upon the type of material being welded, the thickness of the material, the welding position, the deposition rate and the mechanical properties. These variables are:
- Type of electrode wire
- Size of electrode wire
- Type of gas (not applicable to self-shielding wires FCAW)
- Gas flow rate (not applicable to self-shielding wires FCAW)

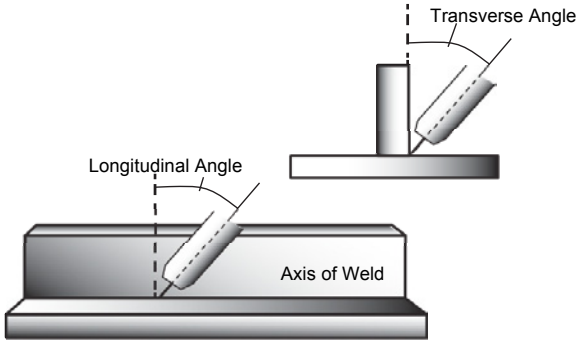
Primary Adjustable Variables
These control the process after preselected variables have been found. They control the penetration, bead width, bead height, arc stability, deposition rate and weld soundness. They are:
- Arc Voltage
- Welding current (wire feed speed)
- Travel speed

Secondary Adjustable Variables
These variables cause changes in primary adjustable variables which in turn cause the desired change in the bead formation. They are:
1. Stick-out (distance between the end of the contact tube (tip) and the end of the electrode wire). Maintain at about 10mm stick-out
2. Wire Feed Speed. Increase in wire feed speed increases weld current. Decrease in wire feed speed decreases weld current.

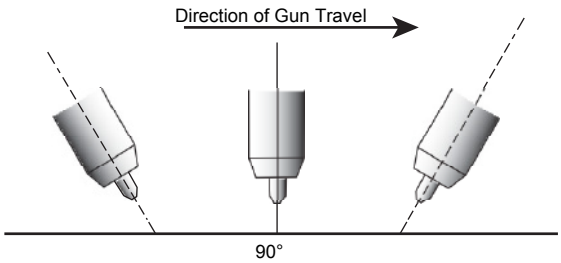


Electrode Stick-Out
Figure 1-8

3. Nozzle Angle. This refers to the position of the welding gun in relation to the joint. The transverse angle is usually one half the included angle between plates forming the joint. The longitudinal angle is the angle between the centre line of the welding gun and a line perpendicular to the axis of the weld. The longitudinal angle is generally called the Nozzle Angle and can be either trailing (pulling) or leading (pushing). Whether the operator is left handed or right handed has to be considered to realize the effects of each angle in relation to the direction of travel.



Transverse and Longitudinal Nozzle Axes
Figure 1-9



Nozzle Angle, Right Handed Operator
Figure 1-10

Establishing the Arc and Making Weld Beads
Before attempting to weld on a finished piece of work, it is recommended that practice welds be made on a sample metal of the same material as that of the finished piece.

The easiest welding procedure for the beginner to experiment with MIG welding is the flat position. The equipment is capable of flat, vertical and overhead positions.

For practicing MIG welding, secure some pieces of 16 or 18 gauge (1.5mm or 2.0mm) mild steel plate (150 x 150mm). Use (0.8mm) flux cored gasless wire or a solid wire with shielding gas.

Setting of the Power Source
Power source and Wirefeeder setting requires some practice by the operator, as the welding plant has two control settings that have to balance. These are the Wirespeed control and the welding Voltage Control. The welding current is determined by the Wirespeed control, the current will increase with increased Wirespeed, resulting in a shorter arc. Less wire speed will reduce the current and lengthen the arc. Increasing the welding voltage hardly alters the current level, but lengthens the arc. By decreasing the voltage, a shorter arc is obtained with a little change in current level.

When changing to a different electrode wire diameter, different control settings are required. A thinner electrode wire needs more Wirespeed to achieve the same current level.

A satisfactory weld cannot be obtained if the Wirespeed and Voltage settings are not adjusted to suit the electrode wire diameter and the dimensions of the work piece.

If the Wirespeed is too high for the welding voltage, “stubbing” will occur as the wire dips into the molten pool and does not melt. Welding in these conditions normally produces a poor weld due to lack of fusion. If, however, the welding voltage is too high, large drops will form on the end of the wire, causing spatter. The correct setting of voltage and Wirespeed can be seen in the shape of the weld deposit and heard by a smooth regular arc sound. Refer to the Weld Guide located on the inside of the wirefeed compartment door for setup information.

Electrode Wire Size Selection
The choice of Electrode wire size and shielding gas used depends on the following

- Thickness of the metal to be welded
- Type of joint
- Capacity of the wire feed unit and Power Source
- The amount of penetration required
- The deposition rate required
- The bead profile desired
- The position of welding
- Cost of the wire

MIG Welding Troubleshooting

MIG (GMAW/FCAW) Welding Troubleshooting

Solving Problems beyond the Welding Terminals
The general approach to fix Gas Metal Arc Welding (GMAW) problems is to start at the wire spool then work through to the MIG torch. There are two main areas where problems occur with GMAW, Porosity and Inconsistent wire feed

Solving Problems beyond the Welding Terminals - Porosity
When there is a gas problem the result is usually porosity within the weld metal. Porosity always stems from some contaminant within the molten weld pool which is in the process of escaping during solidification of the molten metal. Contaminants range from no gas around the welding arc to dirt on the work piece surface. Porosity can be reduced by checking the following points.

FAULT	CAUSE
1 Shielding gas cylinder contents and flow meter.	Ensure that the shielding gas cylinder is not empty and the flow meter is correctly adjusted to 15 litres per minute.
2 Gas leaks.	Check for gas leaks between the regulator/cylinder connection and in the gas hose to the Power Source.
3 Internal gas hose in the Power Source.	Ensure the hose from the solenoid valve to the torch adaptor has not fractured and that it is connected to the torch adaptor.
4 Welding in a windy environment.	Shield the weld area from the wind or increase the gas flow.
5 Welding dirty, oily, painted, oxidised or greasy plate.	Clean contaminates off the work piece.
6 Distance between the MIG torch nozzle and the work piece.	Keep the distance between the MIG torch nozzle and the work piece to a minimum.
7 Maintain the MIG torch in good working order.	Ensure that the gas holes are not blocked and gas is exiting out of the torch nozzle. Do not restrict gas flow by allowing spatter to build up inside the torch nozzle. Check that the MIG torch O-rings are not damaged.

Table 1-2: Solving Problems beyond the Welding Terminals-Porosity

WARNING

Disengage the feed roll when testing for gas flow by ear.

Solving Problems beyond the Welding Terminals – Inconsistent Wire Feed

Wire feeding problems can be reduced by checking the following points.

FAULT	CAUSE
1 Feed roller driven by motor in the cabinet slipping.	Wire spool brake is too tight.
2 Wire spool unwound and tangled.	Wire spool brake is too loose.
3 Worn or incorrect feed roller size	A. Use a feed roller matched to the size you are welding. Replace feed roller if worn.
4 Wire rubbed against the misaligned guides and reduced wire feedability.	Misalignment of inlet/outlet guides
5 Liner blocked with swarf	A. Increased amounts of swarf are produced by the wire passing through the feed roller when excessive pressure is applied to the pressure roller adjuster. B. Swarf can also be produced by the wire passing through an incorrect feed roller groove shape or size. C. Swarf is fed into the conduit liner where it accumulates thus reducing wire feedability.
6 Incorrect or worn contact tip	A. The contact tip transfers the weld current to the electrode wire. If the hole in the contact tip is too large then arcing may occur inside the contact tip resulting in the wire jamming in the contact tip B. When using soft wire such as aluminium it may become jammed in the contact tip due to expansion of the wire when heated. A contact tip designed for soft wires should be used.
7 Poor work lead contact to work piece	If the work lead has a poor electrical contact to the work piece then the connection point will heat up and result in a reduction of power at the arc.
8 Bent liner	This will cause friction between the wire and the liner thus reducing wire feedability

Table 1-3: Wire Feeding Problems

Basic GMAW (MIG) Welding Troubleshooting

FAULT	CAUSE	REMEDY
1 Undercut	A Welding arc voltage too high. B Incorrect torch angle C Excessive heat input	A Decrease voltage or increase the wire feed speed. B Adjust angle. C Increase the torch travel speed and/or decrease welding current by decreasing the voltage or decreasing the wire feed speed.
2 Lack of penetration	A Welding current too low B Joint preparation too narrow or gap too tight C Shielding gas incorrect	A Increase welding current by increasing wire feed speed and increasing voltage. B Increase joint angle or gap. C Change to a gas which gives higher penetration.
3 Lack of fusion	Voltage too low	Increase voltage.
4 Excessive spatter	A Voltage too high B Voltage too low	A Decrease voltage or increase the wirespeed control. B Increase the voltage or decrease wirespeed.
5 Irregular weld shape	A Incorrect voltage and current settings. Convex, voltage too low. Concave, voltage too high. B Wire is wandering. C Incorrect shielding gas D Insufficient or excessive heat input	A Adjust voltage and current by adjusting the voltage control and the wirespeed control. B Replace contact tip. C Check shielding gas. D Adjust the wirespeed control or the voltage control.
6 Weld cracking	A Weld bead is too small B Weld penetration narrow and deep C Excessive weld stresses D Excessive voltage E Cooling rate too fast	A Decrease travel speed B Reduce current and voltage and increase MIG torch travel speed or select a lower penetration shielding gas. C Increase weld metal strength or revise design D Decrease voltage. E Slow the cooling rate by preheating part to be welded or cool slowly.
7 Cold weld puddle	A Loose welding cable connection. B Low power supply voltage	A Check all welding cable connections. B Contact supply authority
8 Arc does not have a crisp sound that short arc exhibits when the wirefeed speed and voltage are adjusted correctly.	The MIG torch has been connected to the wrong voltage polarity on the front panel.	Connect the MIG torch to the positive (+) welding terminal for solid wires and gas shielded flux cored wires. Refer to the electrode wire manufacturer for the correct polarity.

Table 1-4: GMAW (MIG) Welding Problems

Basic MMA/ARC Welding Guide

Stick (MMA) Basic Welding Technique

Size of Electrode

The electrode size is determined by the thickness of metals being joined and can also be governed by the type of welding machine available. Small welding machines will only provide sufficient current (amperage) to run the smaller size electrodes.
For thin sections, it is necessary to use smaller electrodes otherwise the arc may burn holes through the job. A little practice will soon establish the most suitable electrode for a given application.

Storage of Electrodes

Always store electrodes in a dry place and in their original containers.

Electrode Polarity

Electrodes are generally connected to the ELECTRODE HOLDER with the Electrode Holder connected positive polarity. The WORK LEAD is connected negative polarity and is connected to the work piece. If in doubt consult the electrode data sheet or your nearest Accredited Thermal Arc Distributor.

Effects of Stick Welding Various Materials

High Tensile and Alloy Steels

The two most prominent effects of welding these steels are the formation of a hardened zone in the weld area, and, if suitable precautions are not taken, the occurrence in this zone of under-bead cracks. Hardened zone and under-bead cracks in the weld area may be reduced by using the correct electrodes, preheating, using higher current settings, using larger electrodes sizes, short runs for larger electrode deposits or tempering in a furnace.

Manganese Steels

The effect on manganese steel of slow cooling from high temperatures is to embrittle it. For this reason it is absolutely essential to keep manganese steel cool during welding by quenching after each weld or skip welding to distribute the heat.

Cast Iron

Most types of cast iron, except white iron, are weldable. White iron, because of its extreme brittleness, generally cracks when attempts are made to weld it. Trouble may also be experienced when welding white-heart malleable, due to the porosity caused by gas held in this type of iron.

Copper and Alloys

The most important factor is the high rate of heat conductivity of copper, making pre-heating of heavy sections necessary to give proper fusion of weld and base metal.

Types of Electrodes

Arc Welding electrodes are classified into a number of groups depending on their applications. There are a great number of electrodes used for specialized industrial purposes which are not of particular interest for everyday general work. These include some low hydrogen types for high tensile steel, cellulose types for welding large diameter pipes, etc. The range of electrodes dealt with in this publication will cover the vast majority of applications likely to be encountered; are all easy to use.

Metal Being Joined	Electrode	Comments
Mild Steel	E6011	This electrode is used for all-position welding or for welding on rusty, dirty, less-than-new metal. It has a deep, penetrating arc and is often the first choice for repair or maintenance work.
Mild Steel	E6013	This all-position, electrode is used for welding clean, new sheet metal. Its soft arc has minimal spatter, moderate penetration and an easy-to-clean slag.
Mild Steel	E7014	All positional, ease to use electrode for use on thicker steel than E6013. Especially suitable sheet metal lap joints and fillet welds, general purpose plate welding.
Mild Steel	E7018	A low-hydrogen, all-position electrode used when quality is an issue or for hard-to-weld metals. It has the capability of producing more uniform weld metal, which has better impact properties at low temperatures.
Cast Iron	Eni-CI	Suitable for joining all cast irons except white cast iron.
Stainless Steel	E318L-16	High corrosion resistances. Ideal for dairy work etc.

Arc Welding Practice

The techniques used for arc welding are almost identical regardless of what types of metals are being joined. Naturally enough, different types of electrodes would be used for different metals as described in the preceding section.

Welding Position

The electrodes dealt with in this publication can be used in most positions, i.e. they are suitable for welding in flat, horizontal, vertical and overhead positions. Numerous applications call for welds to be made in positions intermediate between these. Some of the common types of welds are shown in Figures 1-15 through 1-22.

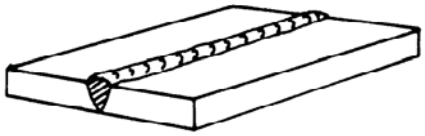


Figure 1-11: Flat Position, Down Hand Butt Weld

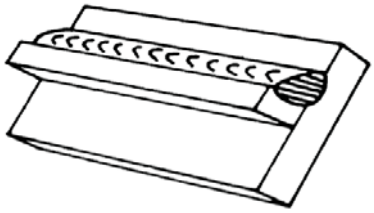


Figure 1-12: Flat Position, Gravity Fillet Weld

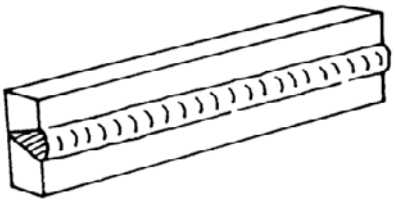


Figure 1-13: Horizontal Position, Butt Weld

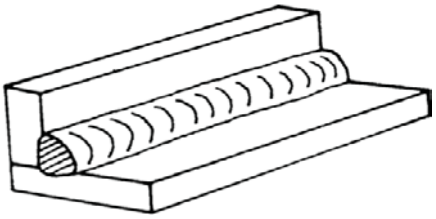


Figure 1-14: Horizontal-Vertical (HV) Position

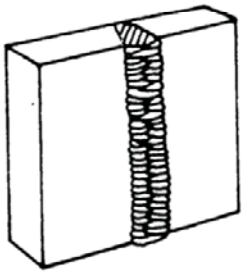


Figure 1-15: Vertical Position, Butt Weld

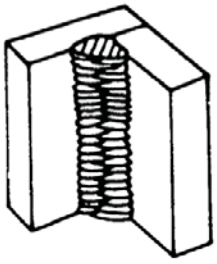


Figure 1-16: Vertical Position, Fillet Weld

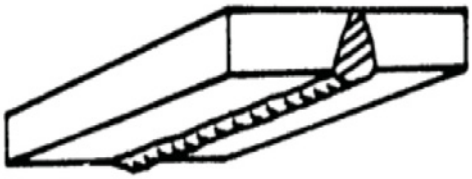


Figure 1-17: Overhead Position, Butt Weld

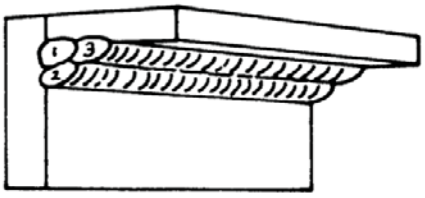
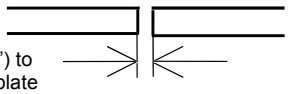


Figure 1-18: Overhead Position, Fillet Weld

Joint Preparations

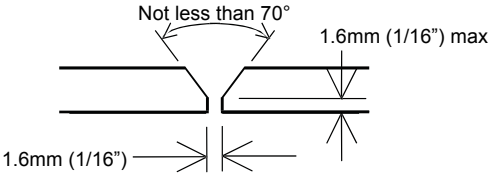
In many cases, it will be possible to weld steel sections without any special preparation. For heavier sections and for repair work on castings, etc., it will be necessary to cut or grind an angle between the pieces being joined to ensure proper penetration of the weld metal and to produce sound joints.
In general, surfaces being welded should be clean and free of rust, scale, dirt, grease, etc. Slag should be removed from oxy-cut surfaces. Typical joint designs are shown in Figure 1-19.

Open Square Butt Joint



Gap varies from 1.6mm (1/16”) to 4.8mm (3/16”) depending on plate thickness

Single Vee Butt Joint



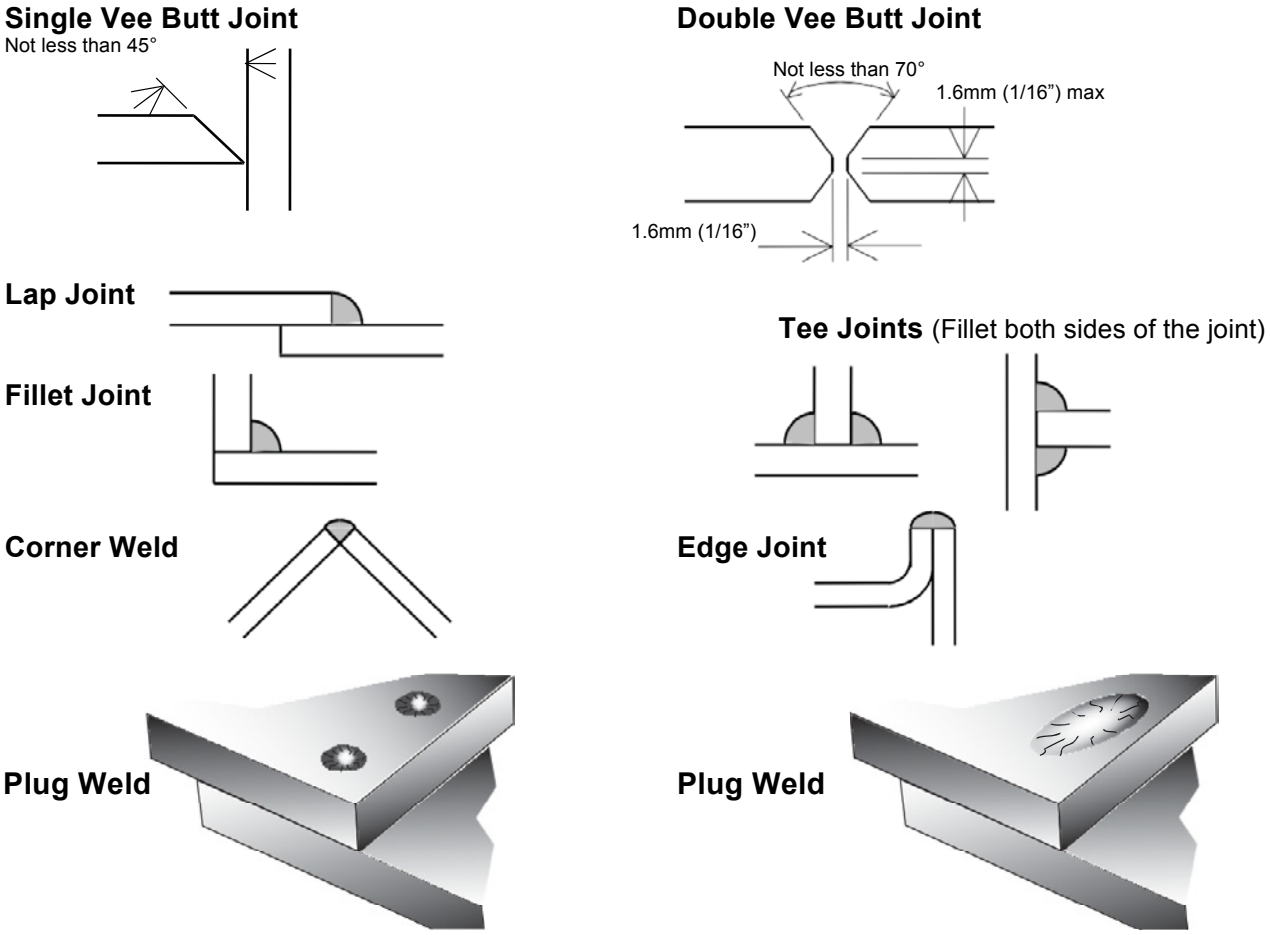


Figure 1-19: Typical Joint Designs for Arc Welding

Arc Welding Technique - A Word to Beginners

For those who have not yet done any welding, the simplest way to commence is to run beads on a piece of scrap plate. Use mild steel plate about 6.0mm thick and a 3.2mm electrode. Clean any paint, loose scale or grease off the plate and set it firmly on the work bench so that welding can be carried out in the downhand position. Make sure that the work clamp is making good electrical contact with the work, either directly or through the work table. For light gauge material, always clamp the work lead directly to the job, otherwise a poor circuit will probably result.

The Welder

Place yourself in a comfortable position before beginning to weld. Get a seat of suitable height and do as much work as possible sitting down. Don't hold your body tense. A taut attitude of mind and a tensed body will soon make you feel tired. Relax and you will find that the job becomes much easier. You can add much to your peace of mind by wearing a leather apron and gauntlets. You won't be worrying then about being burnt or sparks setting alight to your clothes.

Place the work so that the direction of welding is across, rather than to or from, your body. The electrode holder lead should be clear of any obstruction so that you can move your arm freely along as the electrode burns down. If the lead is slung over your shoulder, it allows greater freedom of movement and takes a lot of weight off your hand. Be sure the insulation on your cable and electrode holder is not faulty; otherwise you are risking an electric shock.

Striking the Arc

Practice this on a piece of scrap plate before going on to more exacting work. You may at first experience difficulty due to the tip of the electrode "sticking" to the work piece. This is caused by making too heavy a contact with the work and failing to withdraw the electrode quickly enough. A low amperage will accentuate it. This freezing-on of the tip may be overcome by scratching the electrode along the plate surface in the same way as a match is struck. As soon as the arc is established, maintain a 1.6mm to 3.2mm gap between the burning electrode end and the parent metal. Draw the electrode slowly along as it melts down.

Another difficulty you may meet is the tendency, after the arc is struck, to withdraw the electrode so far that the arc is broken again. A little practice will soon remedy both of these faults.

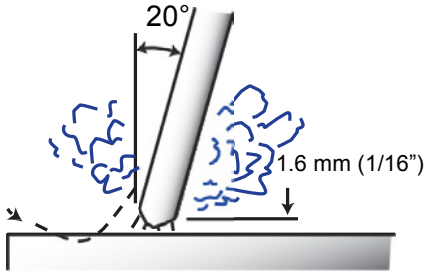


Figure 1-20: Striking an Arc

Arc Length

The securing of an arc length necessary to produce a neat weld soon becomes almost automatic. You will find that a long arc produces more heat. A very long arc produces a crackling or spluttering noise and the weld metal comes across in large, irregular blobs. The weld bead is flattened and spatter increases. A short arc is essential if a high quality weld is to be obtained although if it is too short there is the danger of it being blanketed by slag and the electrode tip being solidified in. If this should happen, give the electrode a quick twist back over the weld to detach it. Contact or "touch-weld" electrodes such as E7014 Stick electrodes do not stick in this way, and make welding much easier.

Rate of Travel

After the arc is struck, your next concern is to maintain it, and this requires moving the electrode tip towards the molten pool at the same rate as it is melting away. At the same time, the electrode has to move along the plate to form a bead. The electrode is directed at the weld pool at about 20º from the vertical. The rate of travel has to be adjusted so that a well-formed bead is produced.

If the travel is too fast, the bead will be narrow and strung out and may even be broken up into individual globules. If the travel is too slow, the weld metal piles up and the bead will be too large.

Making Welded Joints

Having attained some skill in the handling of an electrode, you will be ready to go on to make up welded joints.

A. Butt Welds

Set up two plates with their edges parallel, as shown in Figure 1-21, allowing 1.6mm to 2.4mm gap between them and tack weld at both ends. This is to prevent contraction stresses from the cooling weld metal pulling the plates out of alignment. Plates thicker than 6.0mm should have their mating edges bevelled to form a 70º to 90º included angle. This allows full penetration of the weld metal to the root. Using a 3.2mm E7014 Stick electrode at 100 amps, deposit a run of weld metal on the bottom of the joint.

Do not weave the electrode, but maintain a steady rate of travel along the joint sufficient to produce a well-formed bead. At first you may notice a tendency for undercut to form, but keeping the arc length short, the angle of the electrode at about 20º from vertical, and the rate of travel not too fast, will help eliminate this. The electrode needs to be moved along fast enough to prevent the slag pool from getting ahead of the arc. To complete the joint in thin plate, turn the job over, clean the slag out of the back and deposit a similar weld.

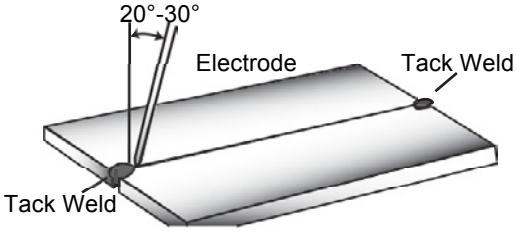


Figure 1-21: Butt Weld

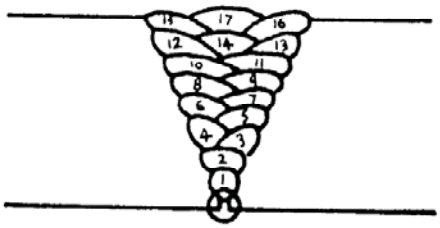


Figure 1-22: Weld Build up Sequence

Heavy plate will require several runs to complete the joint. After completing the first run, chip the slag out and clean the weld with a wire brush. It is important to do this to prevent slag being trapped by the second run. Subsequent runs are then deposited using either a weave technique or single beads laid down in the sequence

shown in Figure 1-22. The width of weave should not be more than three times the core wire diameter of the electrode. When the joint is completely filled, the back is either machined, ground or gouged out to remove slag which may be trapped in the root, and to prepare a suitable joint for depositing the backing run. If a backing bar is used, it is not usually necessary to remove this, since it serves a similar purpose to the backing run in securing proper fusion at the root of the weld.

B. Fillet Welds

These are welds of approximately triangular cross-section made by depositing metal in the corner of two faces meeting at right angles. Refer to Figure 1-14.

A piece of angle iron is a suitable specimen with which to begin, or two lengths of strip steel may be tacked together at right angles. Using a 3.2mm E7014 Stick electrode at 100 amps, position angle iron with one leg horizontal and the other vertical. This is known as a horizontal-vertical (HV) fillet. Strike the arc and immediately bring the electrode to a position perpendicular to the line of the fillet and about 45º from the vertical. Some electrodes require being sloped about 20º away from the perpendicular position to prevent slag from running ahead of the weld. Refer to Figure 1-23. Do not attempt to build up much larger than 6.4mm width with a 3.2mm electrode, otherwise the weld metal tends to sag towards the base, and undercut forms on the vertical leg. Multi-runs can be made as shown in Figure 1-24. Weaving in HV fillet welds is undesirable.

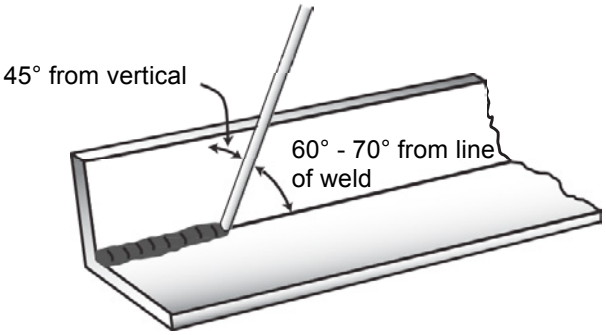


Figure 1-23: Electrode Position for HV Fillet Weld

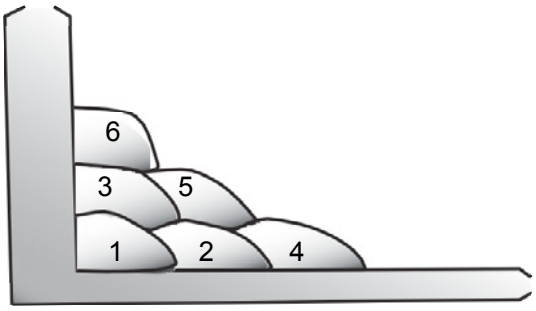


Figure 1-24: Multi-runs in HV Fillet Weld

C. Vertical Welds

1. Vertical Up

Tack weld a three feet length of angle iron to your work bench in an upright position. Use a 3.2mm E7014 Stick electrode and set the current at 100 amps. Make yourself comfortable on a seat in front of the job and strike the arc in the corner of the fillet. The electrode needs to be about 10º from the horizontal to enable a good bead to be deposited. Refer Figure 1-25. Use a short arc, and do not attempt to weave on the first run. When the first run has been completed de-slag the weld deposit and begin the second run at the bottom. This time a slight weaving motion is necessary to cover the first run and obtain good fusion at the edges. At the completion of each side motion, pause for a moment to allow weld metal to build up at the edges, otherwise undercut will form and too much metal will accumulate in the centre of the weld. Figure 1-26 illustrates multi-run technique and Figure 1-27 shows the effects of pausing at the edge of weave and of weaving too rapidly.

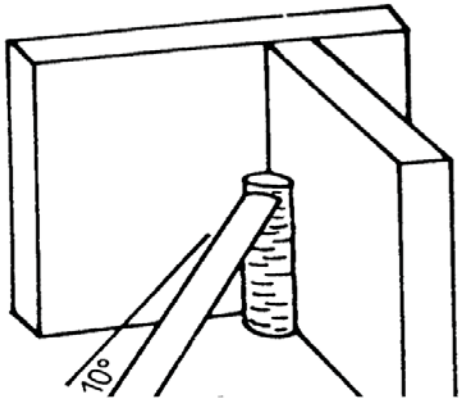


Figure 1-25: Single Run Vertical Fillet Weld

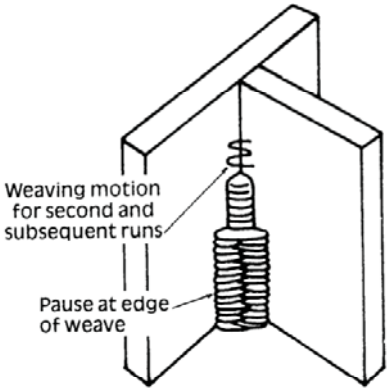


Figure 1-26: Multi Run Vertical Fillet Weld

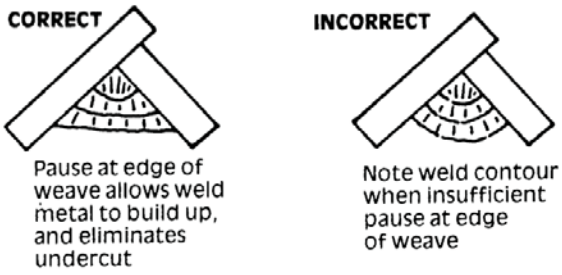


Figure 1-27: Examples of Vertical Fillet Welds

2. Vertical Down

The E7014 Stick electrode makes welding in this position particularly easy. Use a 3.2mm electrode at 100 amps. The tip of the electrode is held in light contact with the work and the speed of downward travel is regulated so that the tip of the electrode just keeps ahead of the slag. The electrode should point upwards at an angle of about 45º.

3. Overhead Welds

Apart from the rather awkward position necessary, overhead welding is not much more difficult that downhand welding. Set up a specimen for overhead welding by first tacking a length of angle iron at right angles to another piece of angle iron or a length of waste pipe. Then tack this to the work bench or hold in a vice so that the specimen is positioned in the overhead position as shown in the sketch. The electrode is held at 45º to the horizontal and tilted 10º in the line of travel (Figure 1-28). The tip of the electrode may be touched lightly on the metal, which helps to give a steady run. A weave technique is not advisable for overhead fillet welds. Use a 3.2mm E6013 Stick electrode at 100 amps, and deposit the first run by simply drawing the electrode along at a steady rate. You will notice that the weld deposit is rather convex, due to the effect of gravity before the metal freezes.

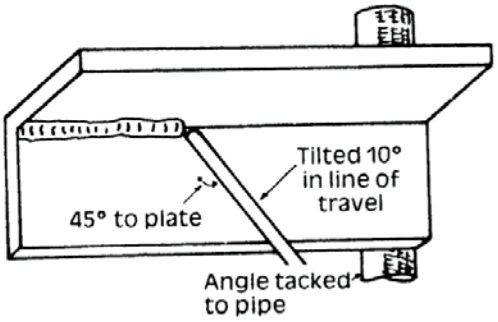


Figure 1-28: Overhead Fillet Weld

MMA/ARC Troubleshooting

Stick (MMA) Welding Troubleshooting

FAULT	CAUSE	REMEDY
1 Welding current varying	ARC FORCE control knob is set at a value that causes the welding current to vary excessively with the arc length.	Reduce the ARC FORCE control knob until welding current is reasonably constant while prohibiting the electrode from sticking to the work piece when you “dig” the electrode into the workpiece.
2 A gap is left by failure of the weld metal to fill the root of the weld.	A Welding current too low B Electrode too large for joint. C Insufficient gap.	A Increase welding current. B Use smaller diameter electrode. C Allow wider gap.
3 Non-metallic particles are trapped in the weld metal.	A Non-metallic particles may be trapped in undercut from previous run. B Joint preparation too restricted. C Irregular deposits allow slag to be trapped. D Lack of penetration with slag trapped beneath weld bead. E Rust or mill scale is preventing full fusion. F Wrong electrode for position in which welding is done.	A If a bad undercut is present clean slag bout and cover with a run from a smaller gauge electrode. B Allow for adequate penetration and room for cleaning out the slag. C If very bad, chip or grind out irregularities. D Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from comers. E Clean joint before welding. F Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

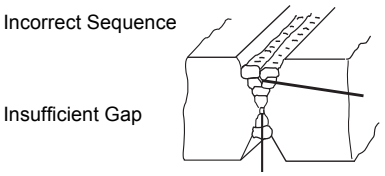


Figure 1: Example of insufficient gap or incorrect sequence

4 A groove has been formed in the base metal adjacent to the toe of a weld and has not been filled by the weld metal (undercut).	A Welding current is too high. B Welding arc is too long. C Angle of the electrode is incorrect. D Joint preparation does not allow correct electrode angle. E Electrode too large for joint. F Insufficient deposit time at edge of weave. G Power source is set for MIG (GMAW) welding.	A Reduce welding current. B Reduce the length of the welding arc. C Electrode should not be inclined less than 45° to the vertical face. D Allow more room in joint for manipulation of the electrode. E Use smaller gauge electrode. F Pause for a moment at edge of weave to allow weld metal build-up. G Set power source to STICK (MMA) mode.
5 Portions of the weld run do not fuse to the surface of the metal or edge of the joint.	A Small electrodes used on heavy cold plate. B Welding current is too low. C Wrong electrode angle. D Travel speed of electrode is too high. E Scale or dirt on joint surface.	A Use larger electrodes and preheat the plate. B Increase welding current. C Adjust angle so the welding arc is directed more into the base metal. D Reduce travel speed of electrode. E Clean surface before welding.

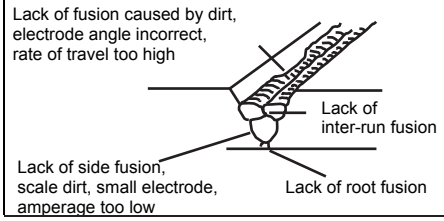

Lack of fusion caused by dirt, electrode angle incorrect, rate of travel too high
Lack of inter-run fusion
Lack of side fusion, scale dirt, small electrode, amperage too low
Lack of root fusion

Figure 2: Example of Lack of Fusion

6 Gas pockets or voids in weld metal (porosity)	A High levels of sulphur in steel. B Electrodes are damp. C Welding current is too high. D Surface impurities such as oil, grease, paint, etc. E Welding in a windy environment. F Electrode damaged i.e. flux coating incomplete.	A Use an electrode that is designed for high sulphur steels. B Dry electrodes before use. C Reduce welding current. D Clean joint before welding. E Shield the weld area from the wind. F Discard damaged electrodes and only use electrodes with a complete flux coating.
7 Crack occurring in weld metal soon after solidification commences	A Rigidity of joint. B Insufficient throat thick- ness. C Weld current is too high.	A Redesign to relieve weld joint of severe stresses or use crack resistance electrodes. B Travel slightly slower to allow greater build up in throat. C Decrease welding current.

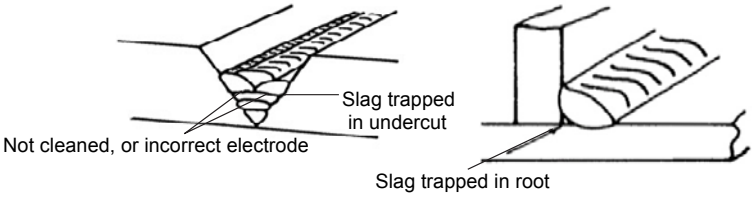


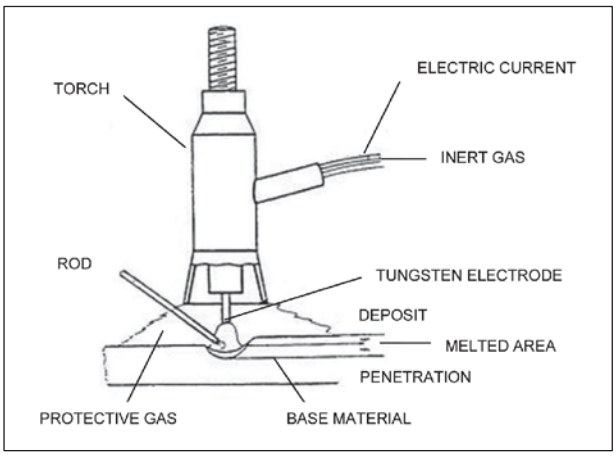
Figure 3: Example of Slag Inclusion

Table 1-6: Welding Problems MMA (Stick)

Basic TIG Welding Guide

TIG Welding is a fusion procedure that uses as a source of heat an electric ARC created between an infusible tungsten electrode and base material to be welded. For TIG welding an inert gas must be used (Argon) which protects the welding bead. If filling material is used, it is made up of rods suitable to the material to be welded (steel, stainless steel, copper etc.)

Fig 15. TIG Welding



In TIG mode, welding is possible in all positions: flat, angle, on the edge, vertical and overhead. Furthermore, with respect to other types of welding, the welding joint has greater mechanical resistance, greater corrosion resistance and limited heating in the welded area which limits distortion. Welding can be done even without weld material, guaranteeing a smooth, shiny weld with no impurities or slag.

TIG Electrode Selection and Preparation

ELECTRODE POLARITY

Connect the TIG torch to the negative (-) torch terminal and the work lead to the positive (+) work terminal for direct current straight polarity. Direct current straight polarity is the most widely used polarity for DC TIG welding. It allows limited wear of the electrode since 70% of the heat is concentrated at the work piece.

TUNGSTEN ELECTRODE CURRENT RANGES

Electrode Diameter	DC Current (Amps)
0.040" (1.0mm)	30 – 60
1/16" (1.6mm)	60 – 115
3/32" (2.4mm)	100 – 165
1/8" (3.2mm)	135 – 200
5/32" (4.0mm)	190 – 280
3/16" (4.8mm)	250 – 340

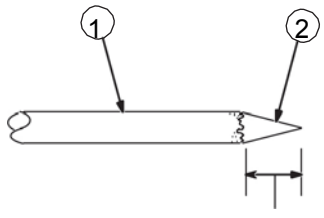
TUNGSTEN ELECTRODE TYPES

Electrode Type (Ground Finish)	Welding Application	Features	Color Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, Long life, High current carrying capacity.	Red
Ceriated 2%	DC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

GUIDE FOR SELECTING FILLER WIRE DIAMETER

Filler Wire Diameter	DC Current Range (Amps)
1/16" (1.6 mm)	20 - 90
3/32" (2.4 mm)	65 - 115
1/8" (3.2 mm)	100 - 165
3/16" (4.8 mm)	200 - 350

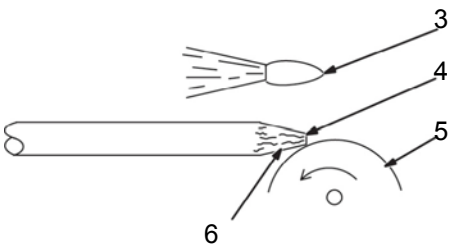
PREPARING TUNGSTEN FOR DC ELECTRODE NEGATIVE (DCEN) WELDING



2.5 x Electrode Diameter

1. **Tungsten Electrode**
2. **Tapered End**

Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.

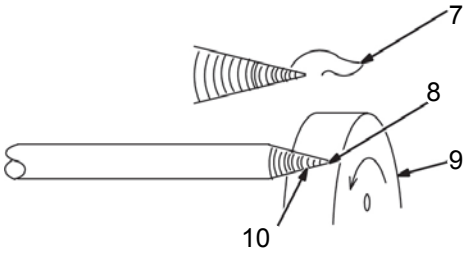


Ideal Tungsten Preparation - Stable ARC

3. **Stable ARC**
4. **Flat**

Diameter of this flat determines amperage capacity.

5. **Grinding Wheel**
6. **Straight ground**



7. **ARC Wander**
8. **Point**
9. **Grinding Wheel**
10. **Radial Ground**

Wrong Tungsten Preparation - Wandering ARC

Fig 16. Preparing Tungsten

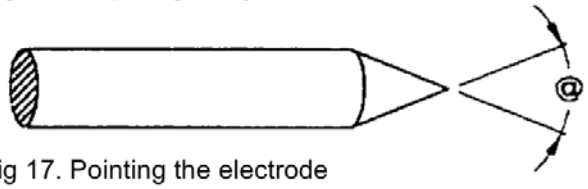


Fig 17. Pointing the electrode
The electrode should be pointed according to the welding current.

Angle @ [°]	Range of current [A]
30	0-30
60-90	30-120
90-120	120-250
120	>250

SHIELDING GAS SELECTION

Alloy	Shielding Gas
Carbon Steel	Welding Argon
Stainless Steel	Welding Argon
Nickel Alloy	Welding Argon
Copper	Welding Argon
Titanium	Welding Argon

TIG WELDING PARAMETERS FOR STEEL

Base Metal Thickness	DC Current for Mild Steel	DC Current for Stainless Steel	Tungsten Electrode Diameter	Filler Rod Diameter (if required)	Argon Gas Flow Rate Liters/min	Joint Type
0.040"	35-45	20-30	0.040"	1/16"	5-7	Butt/Corner
1.0mm	40-50	25-35	1.0mm	1.6mm		Lap/ Fillet
0.045"	45-55	30-45	0.040"	1/16"	5-7	Butt/Corner
1.2mm	50-60	35-50	1.0mm	1.6mm		Lap/ Fillet
1/16"	60-70	40-60	1/16"	1/16"	7	Butt/Corner
1.6mm	70-90	50-70	1.6mm	1.6mm		Lap/ Fillet
1/8"	80-100	65-85	1/16"	3/32"	7	Butt/Corner
3.2mm	90-115	90-110	1.6mm	2.4mm		Lap/ Fillet
3/16"	115-135	100-125	3/32"	1/8"	10	Butt/Corner
4.8mm	140-165	125-150	2.4mm	3.2mm		Lap/ Fillet
¼"	160-175	135-160	1/8"	5/32"	10	Butt/Corner
6.4mm	170-200	160-180	3.2mm	4.0mm		Lap/ Fillet

TIG Welding Trouble Shooting

TIG (GTAW) Welding Problems

FAULT	CAUSE	REMEDY
1 Excessive beard build up or poor penetration or poor fusion at edges of weld.	Welding current is too low	Increase weld current and/or faulty joint preparation.
2 Weld bead too wide and flat or undercut at edges of weld or excessive burn through.	Welding current is too high	Decrease weld current.
3 Weld bead too small or insufficient penetration or ripples in bead are widely spaced apart.	Travel speed too fast	Reduce travel speed.
4 Weld bead too wide or excessive bead build up or excessive penetration in butt joint.	Travel speed too slow	Increase travel speed.
5 Uneven leg length in fillet joint	Wrong placement of filler rod	Re-position filler rod.
6 Electrode melts or oxidises when an arc is struck.	A Torch lead connected to positive welding terminal. B No gas flowing to welding region. C Torch is clogged with dust or dirt. D Gas hose is cut. E Gas passage contains impurities. F Gas regulator turned off. G Torch valve is turned off. H The electrode is too small for the welding current.	A Connect torch lead to negative welding terminal. B Check the gas lines for kinks or breaks and gas cylinder contents. C Clean torch. D Replace gas hose. E Disconnect gas hose from the rear of Power Source then raise gas pressure and blow out impurities. F Turn on. G Turn on. H Increase electrode diameter or reduce the welding current.
7 Dirty weld pool	A Electrode contaminated by contact with work piece or filler rod material. B Work piece surface has foreign material on it. C Gas contaminated with air.	A Clean the electrode by grinding off the contaminates. B Clean surface. C Check gas lines for cuts and loose fitting or change gas cylinder.
8 Poor weld finish	Inadequate shielding gas.	Increase gas flow or check gas line for gas flow problems.
9 Arc start is not smooth.	A Tungsten electrode is too large for the welding current. B The wrong electrode is being used for the welding job. C Gas flow rate is too high. D Incorrect shielding gas is being used. E Poor work clamp connection to work piece.	A Select the right size electrode. B Select the right electrode type. C Select the right rate for the welding job. D Select the right shielding gas. E Improve connection to work piece.
10 Arc flutters during TIG welding.	Tungsten electrode is too large for the welding current.	Select the right size electrode.

Table 1-11: GTAW (TIG) Welding Problems

Machine Care & Maintenance

Ensure the items are disconnected from the electrical supply and cannot operate accidentally when, servicing or cleaning.

The machine does not require any special maintenance; however the user must be aware of the following:

- Regularly clean the ventilation slots.
- Keep the casing clean.
- Check all cables before use.
- Check electrode holders, earth clamps and welding torches before use.
- Replace worn electrode holders and earth clamps, which do not provide a good connection.
- Replace worn consumable parts in a timely manner.
- Replace worn wire drive rollers in a timely manner
- Use a soft cloth or brush to clean electrical components. Do not use liquid cleaning products, water or especially solvents.
- Do not use compressed air to clean electrical components as this can force dirt and dust further into components, causing electrical short circuits.

Check for damaged parts

Do not use the welder with damaged parts, before further use a damaged welder must be carefully checked by a qualified person to determine that it will operate properly. Check for breakage of parts, mountings and other conditions that may affect its operation. An authorised service centre should properly repair a damaged part.

Have your welder repaired by an expert

This appliance is manufactured in accordance with relevant safety standards. Only experts must carry out repairing of electrical appliances, otherwise considerable danger for the user may result. Use only genuine replacement parts, which are available from your nearest Repco store. Do not use modified or non-genuine parts.

Storing the Welder

When not in use the welder should be stored in the dry, out of reach of children and in a frost-free environment.

⚠ **WARNING**	**Before replacing cables / connections make sure the welding machine is switched off and disconnected from the power supply outlet.**

Warranty

1. **DURATION:** The manufacturer warrants that it will repair, at no charge for parts or labour, the RW1500MP Multi-Process Welding Machine, Welding Gun, or Cables, proven defective in material or workmanship, during the following time period(s) after date of original retail purchase:

   For 24 Months Domestic Use or 12 Months Commercial Use:
   The Repco RW1500MP Multi-Process Welding Machine *(excluding accessories)*

2. **WHO GIVES THIS WARRANTY (Warrantor):**
   Repco Pty Limited
   362 Wellington Rd Mulgrave Victoria 3170 Australia

   Repco Limited
   510 Mt Wellington Hwy Auckland New Zealand

3. **WHO RECEIVES THIS WARRANTY (Purchaser):** The original purchaser of this Repco MIG Welder.

4. **WHAT IS COVERED UNDER THIS WARRANTY:** Defects in material and workmanship which occur within the duration of the warranty period. This warranty extends to the Welding Machine, the Welder's Transformer and Rectifier, Welding Gun or Electrode Holder and Cables only.

5. **WHAT IS NOT COVERED UNDER THIS WARRANTY:**

A. Implied warranties, including those of merchantability and FITNESS for a particular purpose are limited in duration to this express warranty. After this period, all risks of loss, from whatever reason, shall be on the purchaser.
B. ANY INCIDENTAL, INDIRECT, OR CONSEQUENTIAL LOSS, DAMAGE, OR EXPENSE THAT MAY RESULT FROM ANY DEFECT, FAILURE OR MALFUNCTION OF THIS PRODUCT.
C. This warranty does not apply to any accessory items included with the product which are subject to wear from usage; the repair or replacement of these items shall be at the expense of the owner. These consumable items include, but are not limited to: Contact Tips, Nozzles, Gun Liners, Drive Rollers, Felt Wire Cleaner. In addition, this warranty does not extend to any damage caused by the untimely replacement or maintenance of any of the previously listed CONSUMABLE parts.
D. Any failure that results from accident, purchaser's abuse, neglect or failure to operate products in accordance with instructions provided in the owner's manual(s) supplied with the product.
E. Pre-delivery service, i.e. assembly and adjustment.

6. **RESPONSIBILITIES OF WARRANTOR UNDER THIS WARRANTY:** Repair or replace, at Warrantor's option, products or components which have failed within duration of the warranty period.

7. **RESPONSIBILITIES OF PURCHASER UNDER THIS WARRANTY:**

A. Please call your nearest Repco Branch for warranty assistance.
B. Provide dated proof of purchase and maintenance records.
C. All welders must be delivered or shipped to the nearest Repco Branch.
   Freight costs, if any, must be borne by the purchaser.
D. Use reasonable care in the operation and maintenance of the products as described in the owner's manual(s).

8. **WHEN WARRANTOR WILL PERFORM REPAIR OR REPLACEMENT UNDER THIS WARRANTY:** Repair or replacement will be scheduled and serviced according to the normal work flow at the servicing location and depending on the availability of replacement parts.

9. **Repco Warranty Statement**

   Repco products may include a warranty against defects for the period stated on the product, in addition to other rights you have at law. Return any defective product and proof of purchase to Repco for assessment, repair or replacement. Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Repco®
362 Wellington Road Mulgrave
Victoria 3170 Australia

510 Mt Wellington Highway
Auckland New Zealand